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CLARK FORK BASIN

SUMMARY

WATER RESERVATION APPLICATIONS

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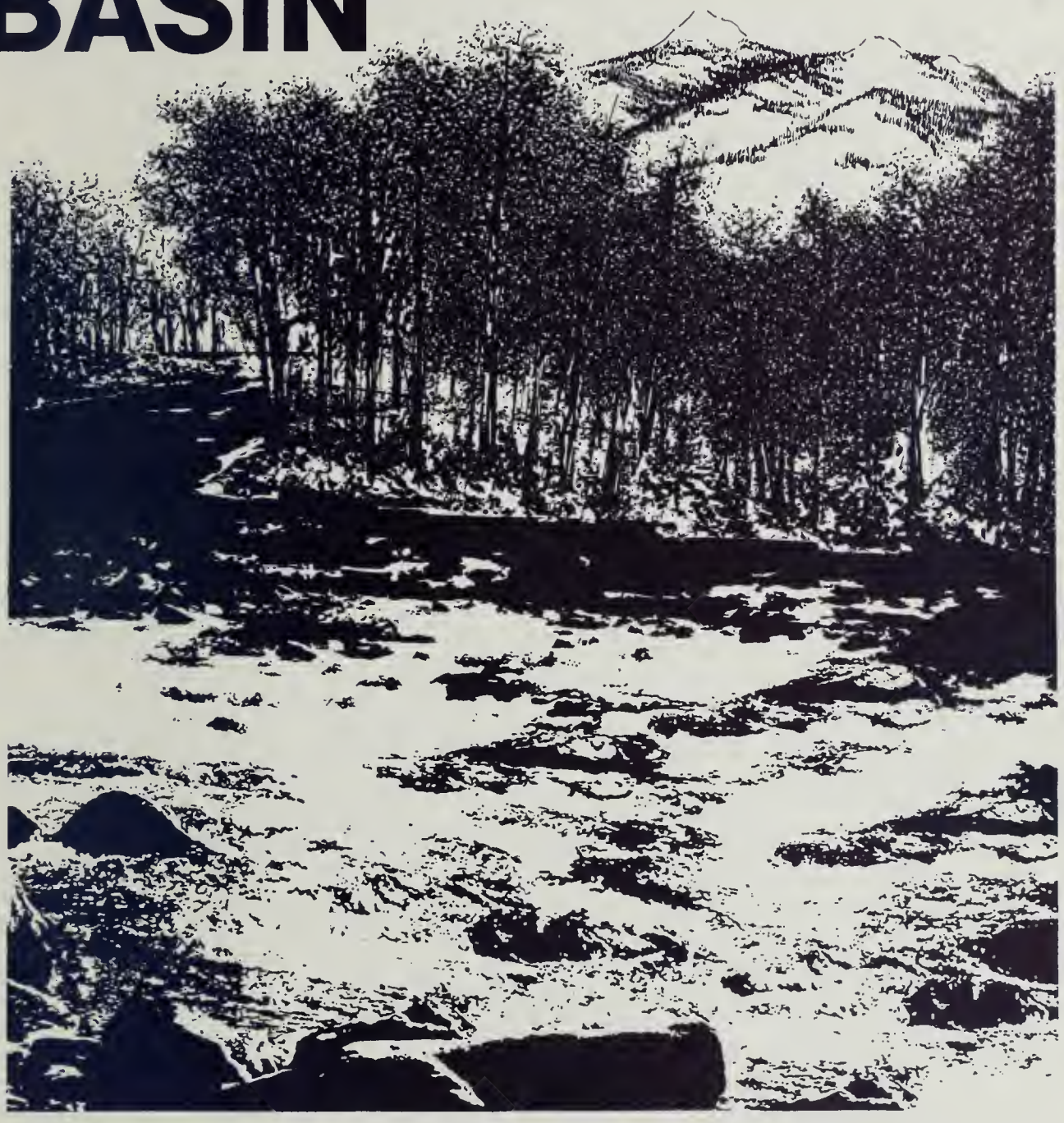

Final Environmental Impact Statement

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SUMMARY

ENVIRONMENTAL IMPACT STATEMENT FOR WATER RESERVATION APPLICATIONS IN THE

UPPER CLARK FORK BASIN

January 1991

Montana Department of Natural Resources
and Conservation

CHAPTER ONE

INTRODUCTION

In December 1988, the Department of Natural Resources and Conservation (DNRC) released the draft environmental impact statement (EIS) on the upper Clark Fork basin water reservation applications. The draft EIS examines water reservation requests from the Granite Conservation District (GCD) and the Montana Department of Fish, Wildlife and Parks (DFWP). GCD is seeking a water reservation on the North Fork of Lower Willow Creek to supply water to supplement irrigation on 2,900 acres of land west of Hall. This project would require a new dam upstream from the existing Lower Willow Creek reservoir. DFWP is requesting reservations to maintain instream flows on the main-stem Clark Fork and 17 tributaries above Milltown Dam for the protection of fish, wildlife, and recreation and to maintain dilution flows for water quality purposes.

Following publication of the draft EIS, the public was given 90 days to comment. DNRC held public meetings in Drummond, Deer Lodge, and Bonner in January 1989, and written comments were accepted until March 16, 1989.

A second reservation request for water on Boulder Creek had been included in GCD's original application (1987), but was omitted from the draft EIS on the basis of a meeting between GCD and DNRC in the spring of 1988. In July 1989, the GCD board chairman sent a letter to DNRC stating GCD's intent to pursue the Boulder Creek proposal, necessitating an addendum to the draft EIS. The addendum was published in March 1990, and examines GCD's proposal to reserve water on Boulder Creek to irrigate 4,093 acres of land southeast of Hall. This project would require a new dam on Boulder Creek. The public comment period of 30 days was extended 15 additional days. A public meeting was held in Drummond on April 4, 1990, and written comments were accepted until May 1, 1990.

The final EIS summarizes, updates, and revises the draft and addendum in response to the 490 written and oral comments received. New and additional information is presented to clarify the analyses contained in the draft EIS and addendum. Some of this information was not available when the draft and addendum were prepared. Written and oral comments are presented with DNRC's responses in Chapter Four. The final EIS does *not* contain recommendations from DNRC to the Board of Natural Resources and Conservation (Board) regarding action on the pending water reservation applications. The decision of whether to grant, modify, or deny a reservation rests with the Board, not DNRC, and will be made after a contested case hearing is held to receive testimony from the applicants and objectors. When deliberating on each reservation application, the Board will rely on information from the application, the draft and final EISs, and evidence presented at the contested case hearing.

Notice of the contested case hearing will be served by first-class mail upon all water right claimants and permittees of record in the upper Clark Fork basin and other persons that may be affected by the proposed reservations. Legal notice will be published in local newspapers, and news releases will also be sent to the newspapers.

Any affected person can participate in the hearings process, either by presenting public testimony without filing an objection or by filing a formal objection to a water reservation application. The notice of the contested case hearing will describe the procedure for participating.

The following summary is provided for readers who do not need the entire EIS. Copies of the complete Final EIS are available on request from DNRC.

CHAPTER TWO

SUMMARY OF THE DRAFT EIS AND ADDENDUM

BOARD DECISION CRITERIA

The draft EIS and the addendum to the draft present DNRC's analyses of the environmental impacts of granting or denying GCD's and DFWP's requests for water reservations in the upper Clark Fork basin. The decision of whether to grant or deny these reservations rests with the Board, which must abide by the following criteria for granting a reservation.

Qualifications and Purpose

The Board must find that the applicant is qualified to reserve water and that the purpose of the reservation is a beneficial use (§ 85-2-316(1) and 85-2-316(4)(a)(i), MCA; ARM 36.16.107B(1)).

Need

The Board must find that the reservation is needed (§ 85-2-316(4)(a)(ii), MCA). A reservation is needed if "there is a reasonable likelihood that future instate or out-of-state competing water uses would consume, degrade, or otherwise affect the water available for the purpose of the reservation" (ARM 36.16.107B (2)(a)), or if "there are constraints that would restrict the applicant from perfecting a water permit for the intended purpose of the reservation" (ARM 36.16.107B(2)(c)).

Amount

The Board must determine the amount needed to fulfill the purpose of the reservation (§85-2-316(4) (A)(iii), MCA). This amount must be based on "accurate and suitable" methods and assumptions. The Board must find that there are no "reasonable cost-effective measures that could be taken within the reservation term to increase the use efficiency and lessen the amount of water required" (ARM 36.16.107(3)).

Public Interest

The Board must find that the reservation is in the public interest (§ 85-2-316(4)(a)(iv), MCA). In making this determination, the Board must weigh and balance "(a) whether the expected benefits of applying the reserved water to beneficial use are reasonably likely to exceed the costs; (b) whether the net benefits associated with granting a reservation exceed the net benefits of not granting the reservation; (c) whether there are no reasonable alternatives to the proposed reservation that have greater net benefits; (d) whether failure to reserve the water will or is likely to result in an irretrievable loss of a natural resource or an irretrievable loss of a resource development opportunity; and (e) whether there are no significant adverse impacts to public health, welfare, and safety." The Board may also consider other factors it finds relevant (ARM 36.16.107B(4)).

Diligence

If the purpose of the reservation requires construction of a storage or diversion facility, the applicant shall establish to the satisfaction of the Board that there will be progress toward completion of the facility and accomplishment of the purpose with reasonable diligence in accordance with an established plan (§ 85-2-316(5), MCA).

No Adverse Effect on Senior Water Rights

The reservation, as proposed for adoption, must not adversely affect water rights in existence at the time of adoption (§ 85-2-316(9), MCA). A reservation cannot be granted if the record of the contested case hearing shows that the exercise of senior water rights would be adversely affected.

SUMMARIES

The remainder of this chapter summarizes the results of DNRC's analyses of the social and environmental effects of granting all, some, or none of the water requested and of putting the water to use as proposed by the applicants. The information presented here is excerpted primarily from chapters Two, Five, Six, and Eight of the draft EIS and from chapters One, Three, and Four of the addendum.

The results are presented here under the relevant Board decision criteria, but do not represent determinations, conclusions, or recommendations of whether any one reservation request satisfies any of the given criteria. Such determinations are made solely by the Board after considering additional information from the contested case hearing.

GCD'S REQUEST ON THE NORTH FORK OF LOWER WILLOW CREEK

GCD is requesting a reservation on the North Fork of Lower Willow Creek, a tributary of Flint Creek, to provide water for supplemental irrigation on 2,900 acres of land west of Hall, as shown in Figure 2-1. This project would require a new dam on the North Fork of Lower Willow Creek. The proposed dam would be 113 feet high, 1,070 feet long, and would store 5,000 acre-feet (af) in a 112-acre reservoir. No new canals would be needed. Water would be released into the North Fork of Lower Willow Creek to refill the existing Lower Willow Creek reservoir.

Qualifications and Purpose

GCD was organized under the state Conservation Districts Act (§ 76-15-101, *et seq.*, MCA) in 1954. Conservation districts are political subdivisions of the state. The stated purpose of the requested reservation is to provide water for supplemental irrigation, which is a beneficial use as defined in Section 85-2-102(2)(a), MCA.

Need

GCD has applied for a reservation and not a permit because it cannot build the project under present economic conditions (GCD 1987). Competing water uses that may limit future water availability on the North Fork of Lower Willow Creek include DFWP's request for instream flow reservations on Flint Creek and the Clark Fork main stem. GCD's project would conflict with DFWP's requested reservations in March and April under average flow conditions. Potential development of irrigable lands on the Clark Fork also may require flows from upstream tributaries.

Amount

GCD has requested up to 11,165 af/year (15.4 cfs) of water to irrigate 2,900 acres of land, but acknowledges that the amount needed for the new reservoir may be less than this. The 11,165 af estimate includes water for lands that are already irrigated with water from Lower Willow Creek reservoir. But the existing reservoir currently meets project demand for full-service irrigation in only 5 years out of 10. The requested reservation would allow GCD to build a new reservoir to catch high spring flows, which would provide for full-service irrigation in 8 years out of 10. The amount was determined based on local crop needs and projected delivery efficiencies. The water would be delivered through existing canals and wheelline sprinkler irrigation systems. DNRC found no economically feasible alternatives that would increase project efficiency or reduce the amount of water required.

Public Interest

The draft EIS examined the benefits and costs of granting GCD's reservation request on the North Fork of Lower Willow Creek. A summary and comparison of the significant benefits and costs is provided here.

Benefits

If GCD's project on the North Fork of Lower Willow Creek returns a profit, it would directly benefit about 20 ranching families by increasing hay yields by 2,000 tons annually on 2,900 acres of land that is already irrigated. Indirect benefits would include improved recreation on the existing Lower Willow Creek reservoir due to higher and more stable water levels. The project could also slightly increase business income and county tax revenues.

Return flows from the North Fork of Lower Willow Creek project would increase streamflows during the high-demand season at MPC's hydropower dams at Milltown and Thompson Falls. These flow increases would offset springtime depletions that would occur when the MPC dams typically spill water. In an average flow year, the project would allow MPC to increase net annual power production by an estimated 79,600 kWh. This is an annual benefit of $1,751 at current wholesale power rates.

FIGURE 2-1.
LOWER WILLOW CREEK PROJECT AREA

Costs

DNRC estimates project costs to be a minimum of $9.97 million, which is three times greater than GCD's estimate of $2.9 million. This disparity is due primarily to differences in the estimated costs of the spillway and outlet works.

Indirect costs of the project on the North Fork of Lower Willow Creek would include possible degradation of fish habitat due to reduced spring flows in the 2.9-mile stream reach between the proposed and existing reservoirs, flooding of wildlife habitat and irrigated land at the reservoir site, and the preclusion of other uses of the water consumed by the project. Project depletions of streamflow would reduce hydropower production at WWP's Noxon Rapids dam by an estimated 81,300 kWh on average. This is an annual cost of $1,789 at current wholesale power rates. Coupled with MPC's net annual gain of an estimated 79,600 kWh, the net effect would be an annual loss in Montana of 1,700 kWh, or $38 at current wholesale power rates. The project would reduce power production at Columbia River hydroelectric plants downstream from Montana by an estimated 800,440 kWh in an average year. This is an annual cost of $17,610 at current wholesale power rates.

Comparison of Net Benefits and Costs

DNRC estimates that the supplemental irrigation supplied by the project would provide net annual returns of $30 per acre. Based on DNRC's estimates of project costs, net annual returns from the supplemental irrigation would have to be $161 per acre for project benefits to exceed costs.

GCD's estimated costs would require a net annual return of $45 per acre from the supplemental irrigation. If GCD's higher yield and price estimates are used, net annual returns would be $90 per acre.

Based on DNRC's yield and price estimates, project costs would exceed benefits.

Alternatives

Project lands might be served by using water stored in the Georgetown Lake/Silver Lake system. The water rights may be for sale. Preliminary cost estimates indicate this option is economically infeasible, though less infeasible than GCD's proposed project.

Irretrievable Losses

Granting GCD a reservation for this project would give the district an earlier priority date than it would have if it obtained a permit when the project is built. If the dam and reservoir are constructed, 112 acres of currently irrigated pasture would be inundated. Reduced flows in the 2.9 mile reach below the proposed dam could imperil a population of pure strain, westlope cutthroat trout, a species with limited distribution.

Public Health, Welfare, and Safety

GCD's proposed dam on the North Fork of Lower Willow Creek would be classified as a high-hazard dam, requiring measures to protect public safety. In an average flow year, the project would slightly reduce the net annual amount of water available to dilute arsenic in Flint Creek, possibly violating current state water quality standards for arsenic. See Chapter Three of the final EIS for a description of arsenic levels in the upper Clark Fork basin.

GCD'S REQUEST ON BOULDER CREEK

GCD is requesting a reservation on Boulder Creek, a tributary of Flint Creek, to provide new irrigation to 4,093 acres of land southeast of Hall, as shown in Figure 2.2. This project would require a new dam on Boulder Creek. The proposed dam would be 145 feet high, 1,150 feet long, and would store 8,500 af in a 145-acre reservoir. Approximately 33 miles of new canal are proposed to deliver water to project lands.

Qualifications and Purpose

GCD was organized under the state Conservation Districts Act (§ 76-15-101, *et seq.*, MCA) in 1954. Conservation districts are political subdivisions of the state. The stated purpose of the requested reservation is to provide water for new irrigation, which is a beneficial use as defined in Section 85-2-102(2)(a), MCA.

Need

GCD has applied for a reservation and not a permit because it cannot build the project under present economic conditions (GCD 1987). Competing water uses that may limit future water availability on Boulder Creek include DFWP's requests for instream flow reservations on Boulder and Flint creeks and the Clark Fork main stem. GCD's project would conflict with DFWP's requested reservations in all months except for

FIGURE 2-2.
PROPOSED BOULDER CREEK RESERVOIR, CANAL, AND IRRIGATED LANDS

May and June in an average flow year. Potential development of irrigable lands on the Clark Fork also may require flows from upstream tributaries, including Boulder Creek.

Amount

GCD has requested 13,998 af/year based on local crop needs and projected delivery efficiencies for sprinkler irrigation. Water would be stored in the reservoir year-round. The peak diversion rate would be 106.7 cfs, and water would be delivered through 33 miles of new canal to sprinkler irrigation systems. If operated as proposed by GCD, the Boulder Creek reservoir would provide a full water supply to the 4,093 acres of project land in roughly 8 or 9 years out of 10.

Of the alternatives examined by DNRC, lining the canal or replacing portions of the canal with a pipeline would reduce canal seepage losses and thus reduce the amount of water needed. Neither of these alternatives was economically feasible.

Public Interest

The addendum examined the benefits and costs of granting GCD's reservation request on Boulder Creek. A summary and comparison of the significant benefits and costs is provided here.

Benefits

If GCD's Boulder Creek project returns a profit, it would directly benefit about 10 ranching families by converting 4,093 acres of pasture to irrigated cropland. Hay production could increase by about 10,000 tons a year. Indirect benefits would include the flatwater recreation opportunities offered by the new reservoir, possible flood control, increased forage for deer and waterfowl, and increased flows in the lower reach of Flint Creek in late summer.

Costs

DNRC estimates that the proposed project would cost $30.4 million, which is more than twice GCD's estimate of $14.2 million. Neither of these estimates includes the costs of acquiring land for the dam and reservoir, acquiring easements for the canal route, and relocating the county road that would be flooded.

Indirect costs of the project would include degradation of fish habitat and riparian vegetation along Boulder Creek at and below the dam site, flooding of wildlife habitat and a 1.3 mile stretch of county road, and the preclusion of other uses of the water.

DNRC estimates that the project would reduce power production from the three hydroelectric plants on the Clark Fork in Montana by 900,500 kWh in a typical year. This is an annual cost of $19,811 at current wholesale power rates. MPC's power production would be reduced by 48,400 kWh at an annual cost of $1,065, and WWP's power production would be reduced by 852,100 kWh at an annual cost of $18,746. The project would reduce power production from Columbia River hydroelectric plants downstream from Montana by an estimated 8,388,500 kWh in a typical year. At current wholesale power rates, this would be an annual cost of $184,547.

Comparison of Net Benefits and Costs

DNRC estimates that the full-service irrigation supplied by the Boulder Creek project would provide net annual returns of approximately $150 per acre. Based on DNRC's estimates of project costs, net annual returns would have to be $358 per acre for project benefits to exceed costs. Based on GCD's cost estimates, net annual returns would have to be $167 per acre for benefits to exceed costs. DNRC's analysis indicates that project costs would exceed benefits.

Alternatives

DNRC examined five alternatives to GCD's proposal. Three of the alternatives--modifying the canal, building a dam on Douglas Creek, and pumping water from Flint Creek--would substantially lower project costs. Of these three alternatives, pumping from Flint Creek would be the cheapest, at a cost of $17.9 million. None of the alternatives is economically feasible.

Irretrievable Losses

Granting GCD a reservation for this project would give the district an earlier priority date than it would have if it obtained a permit when the project is built. Water would not be available for GCD's proposed project if DFWP's requested reservation on Boulder Creek is granted with an earlier priority date.

If the dam and reservoir are constructed, 145 acres of marginal grassland and forest, 1.3 miles of stream and riparian habitat, and one house would be inundated.

Public Health, Welfare, and Safety

GCD's proposed dam on Boulder Creek would be

classified as a high-hazard dam, requiring measures to protect public safety. The project would reduce the net annual amount of water available to dilute arsenic in Flint Creek, possibly violating current state water quality standards. See Chapter Three in the final EIS for estimates of arsenic concentrations in selected tributaries of the upper Clark Fork.

DFWP'S REQUESTS FOR THE UPPER CLARK FORK AND 17 TRIBUTARIES

DFWP is requesting instream flow reservations to protect aquatic habitat, fish, wildlife, and recreation year-round, and to maintain tributary flows from January 1 to April 30 of every year to dilute pollutants in the Clark Fork main stem. DFWP's instream flow requests are summarized in Table 2-1. The location of streams on which DFWP has requested reservations is shown in Figure 2-3.

Qualifications and Purpose

As an agency of the State of Montana, DFWP is a public entity. The stated purpose of the requested reservations is to maintain instream flow for the protection of aquatic habitat, fisheries, wildlife, and recreational resources, and to maintain winter flows for the dilution of metals and other pollutants, which are authorized uses under sections 85-2-102(2)(a) and 85-2-316(1), MCA.

Need

By law, a water right for instream uses can only be obtained with a reservation and not by permit. A pilot program to allow leasing of existing water rights is underway, but this program may be temporary and there are no leasing efforts underway in the upper Clark Fork basin.

If new permits for consumptive uses continue to be issued in the upper Clark Fork basin, the water DFWP has requested for instream purposes would be appropriated for consumptive uses. In addition, nonconsumptive uses such as small hydropower development could deplete portions of reaches critical to fisheries, wildlife, or recreation.

Amount

The amount of water requested for each stream or reach is shown in Table 2-1. To grant DFWP's requested reservations, the Board must find that the methods used to determine the amount of water needed are "accurate and suitable" (ARM 36.16.107(3)).

DFWP used the wetted perimeter inflection point (WETP) method to determine how much instream flow would be needed to protect aquatic habitat for fish and associated food organisms. An overview of how DFWP applied the WETP methodology is provided in Appendix A of the draft EIS, and concerns raised over the application of the WETP method also are discussed in the draft EIS.

DFWP used the WETP method to identify the amount of water needed to cover riffles, which DFWP assumed are the most productive areas of a stream for food organisms used by fish. Under this method, it is assumed that if enough flow remains in a stream to keep riffles wet, then the chief food-producing areas of a stream would be maintained. It follows that if there is enough water to cover the riffles, there would be enough water to protect other types of stream habitat, such as pools, bank cover, channels for fish passage, and spawning and rearing areas.

When used correctly, the WETP method provides a reasonably accurate estimate of the wetted perimeter and can indicate abrupt changes in the amount of stream bottom that remains wet as streamflow increases or decreases. But the precise relationship between wetted perimeter as an indicator of aquatic habitat and the standing crop (number and total weight of fish) a stream will support has not been definitively demonstrated in the upper Clark Fork basin. In its application, DFWP stated that the upper and lower inflection points are thought to bracket flows needed to maintain high and low levels of aquatic habitat.

Streams Where the WETP Method was not Used

DFWP did not use the wetted-perimeter method on Cable and Stuart Mill creeks. These are spring-fed creeks, and DFWP assumed that flows would be relatively stable.

On Cable Creek, three flow measurements, ranging from 10.2 to 12.1 cfs, were made at riffles. Based on these measurements, DFWP assumed that 10 cfs would be adequate to maintain the fishery.

In 1988, DNRC made six flow measurements between April and August in Cable Creek at the highway crossing (NW1/4, NW1/4, SW1/4, Sec. 24, T5N, R13W) and found flows ranging from 5.8 cfs to 16.3 cfs. The Silver Lake ditch enters Cable Creek just above the highway crossing. When the highest flow was measured at the highway crossing, 7.6 cfs was measured in the Silver Lake Ditch (SW1/4, NW1/4, SE1/4, Sec 23, T5N, R13W).

Table 2-1. DFWP's Reservation Requests

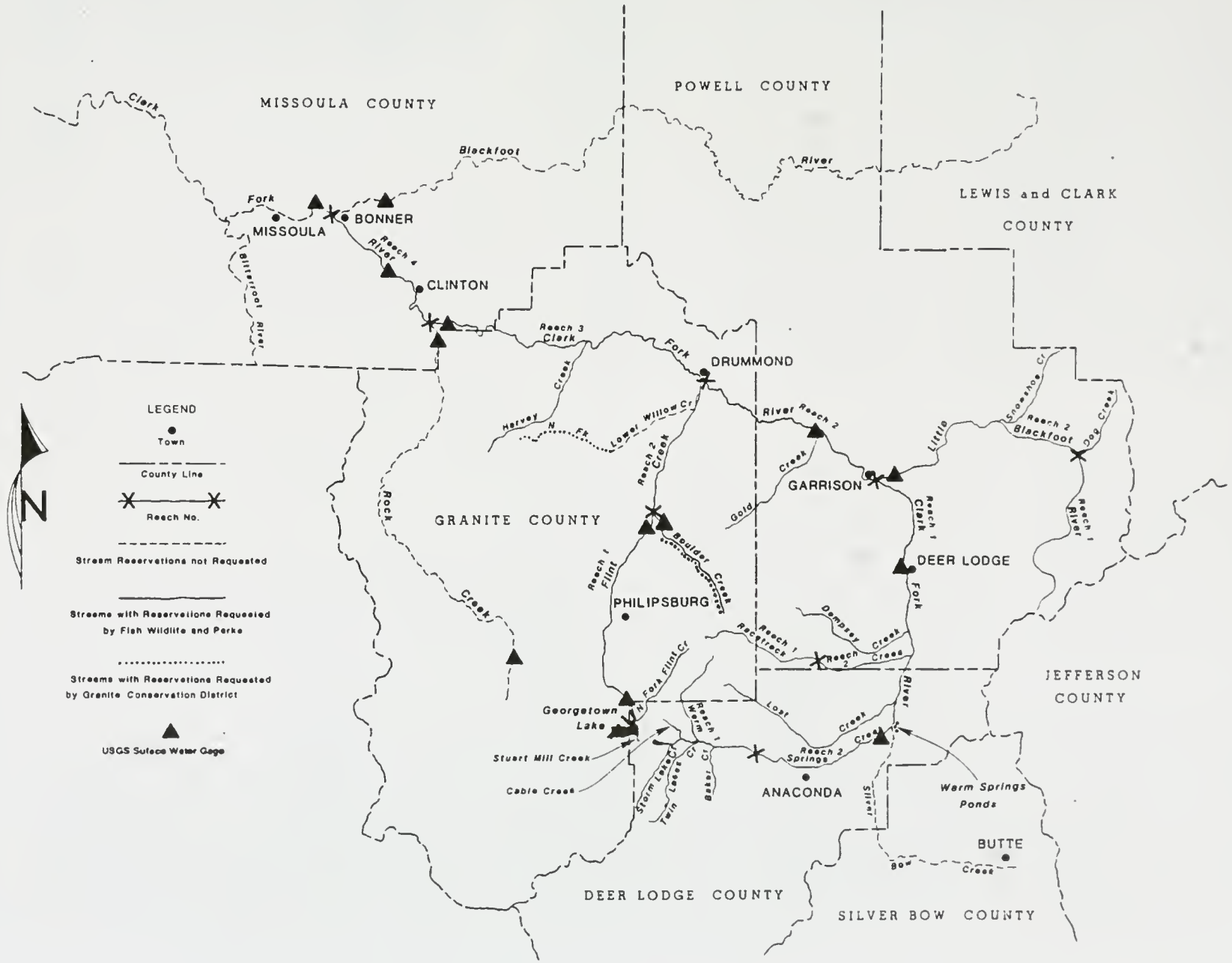
Stream Name	Length of Stream Reach (Miles)	Flows and Volume of Water Requested Year Round	Instream Flows for Water Quality Jan. 1 to April 30
MAIN STEM			
Clark Fork main stem			
Reach 1 (Warm Springs Creek - Little Blackfoot River)	37.8	180 cfs 130,314 af	none
Reach 2 (Little Blackfoot River - Flint Creek)	28.1	400 cfs 289,587 af	none
Reach 3 (Flint Creek - Rock Creek)	35.8	500 cfs 361,983 af	none
Reach 4 (Rock Creek - Milltown)	17.2	600 cfs 434,380 af	none
TRIBUTARIES			
Warm Springs Creek			
Reach 1 (Confluence of Middle Fork Warm Springs Creek - Meyers Dam)	15.3	50 cfs 36,198 af	
Reach 2 (Meyers Dam - Mouth)	16.6	40 cfs 28,959 af	
Barker Creek	5.1	12 cfs 8,688 af	
Cable Creek	5.8	10 cfs 7,240 af	
Storm Lake Creek[b]	10.0	10 cfs 7,240 af 3 cfs 2,172 af	
Twin Lakes Creek	7.5	13 cfs 9,412 af	
Lost Creek	19.9	16 cfs 11,583 af	
Racetrack Creek			
Reach 1 (Confluence of North Fork Racetrack Creek-USFS Boundary)	9.3	26 cfs 18,823 af	
Reach 2 (USFS Boundary - mouth)	10.8	3 cfs 2,172 af	
Dempsey Creek	17.1	3.5 cfs 2,543 af	
Little Blackfoot River			
Reach 1 (Blackfoot Meadows - Dog Creek)	17.4	17 cfs 12,307 af	
Reach 2 (Dog Creek - mouth)	26.9	85 cfs 61,537 af	
Snowshoe Creek	9.2	9 cfs 6,516 af	
Dog Creek	15.5	12 cfs 8,688 af	
Gold Creek	15.0	34 cfs 24,615 af	
Flint Creek			
Reach 1 (Georgetown Lake - Boulder Creek)	28.0	50 cfs 36,198 af	
Reach 2 (Boulder Creek - mouth)	15.7	45 cfs 32,578 af	
Boulder Creek	13.4	20 cfs 14,479 af	
North Fork of Flint Creek	7.5	6 cfs 4,344 af	
Stuart Mill Creek	.3	14 cfs 10,136 af	
Harvey Creek	14.6	3 cfs 2,172 af	

All of the instantaneous base flow, subject to existing, lawfully appropriated water rights until such time as mine waste reclamation allows copper concentrations entering the Clark Fork above Warm Springs Creek to reach acceptable levels in downstream reaches. Flow is requested at each stream's confluence with the Clark Fork.

[a]In addition, DFWP already has claimed rights on Rock Creek and the Blackfoot River.

[b]10 cfs is requested if diversions to Storm Lake do not occur at their usual level. If diversions are resumed at their past levels, the flow request is 3 cfs.

FIGURE 2-3.
RESERVATION REQUESTS IN THE UPPER CLARK FORK BASIN



DFWP found no riffles in Stuart Mill Creek to use as measuring sites and instead took a one-time measurement of 14.5 cfs in mid-September. DFWP assumed that flows remain relatively stable and that there is a low potential for other future uses of water from Stuart Mill Creek in justifying its request for 14 cfs. In fact, average monthly flows fluctuate from 10.7 cfs in May to 19.5 cfs in June and back down to 11.4 cfs in September (see Table 3-1 on page 15 of the draft EIS).

Fifty Percent Limit

The Board cannot grant an instream reservation for more than 50 percent of the average annual flow of record on gauged streams (§ 85-2-816(6), MCA). DFWP requested more than 50 percent of the mean annual flow on the following streams with gauges installed: Clark Fork reaches 1, 2, 3, and 4; Warm Spring Creek Reach 2; and the Little Blackfoot River. On August 16, 1990 a stream gauge was installed on Flint Creek near the mouth (White 1990). The limited gauging recordsmay not reflect average flows over the long term on these reaches. Information on average annual flow presented in Table 5-1 of the draft EIS is updated in Table 2-2 below.

Public Interest

The draft EIS examined the benefits and costs of granting DFWP's reservation requests on the Clark Fork main stem and 17 tributaries. A summary and comparison of the significant benefits and costs is provided here.

Benefits

DFWP's requested reservations would benefit the citizens of Montana by preserving existing flow conditions and existing opportunities for recreation, waste dilution, and other instream uses. Fish and other aquatic life would benefit from the maintenance of aquatic habitat at existing levels. Locally severe reductions in flow due to the use of senior water rights during low-flow periods would still occur, but DFWP's reservations would ensure that flows would not be depleted below existing conditions. The reservations would also protect past and future investments made to improve water quality and fisheries. In particular, granting DFWP's requested reservations on the tributaries would ensure that they would continue to contribute relatively clean water to help dilute toxic metals in the Clark Fork main stem.

Costs

The primary cost of DFWP's requested reservations is that they would limit the amount of water available for future consumptive development in the

Table 2-2. Instream flows requests and average flows based on stream gauges.[a]

	Instream flow requested	Average annual flow of record	50 Percent average annual gauged flow	Years of record	Period of record
Clark Fork - Reach 1	180				
(Deer Lodge)		292	146	11	1978-1989
(Galen)		94.2	47.1	1	1988-1989
Clark Fork - Reach 2	400				
(below Gold Creek)		578	289	12	1977-1989
Clark Fork - Reach 3	500				
(Clinton)		851	425.5	10	1979-1989
Clark Fork - Reach 4	600				
(Turah)		1,050[b]	525	4	1985-1989
Little Blackfoot River	85				
(near Garrison)		165	82.5	17	1972-1989
Warm Springs Creek -	40				
Reach 2		44	22	6	1983-1989
(Warm Springs)					
Flint Creek Reach 1	50				
(Maxville)		100	50	48	1941-1989
(Southern Cross)		29.7	14.9	49	1940-1989

[a]Source: Montana DFWP 1986a; USDI 1990.
[b]USGS does not publish average annual flows until 5 years of records are available, but an average annual flow of 1,050 cfs was calculated for the 4-year period of record.

upper Clark Fork basin. The most likely form of consumptive development in the upper basin is irrigation. However, the number of permits issued for new irrigation in the upper basin has averaged less than three a year since 1973, and only 8,362 acres of undeveloped irrigable land remain in the upper basin. Depending on the method used to estimate agricultural acreage, these 8,362 undeveloped acres represent from 5 to 9 percent of the total amount of irrigable and irrigated land in the upper basin. If DFWP's requested reservations are granted and enforced, they would preclude the development of additional full-service irrigation in the basin above Rock Creek. Some supplemental irrigation might be possible on a local basis.

The potential for new industrial development, such as mining or hydropower, in the upper basin is unknown, but new consumptive uses could be limited to projects that would purchase water rights or store only flows in excess of DFWP's requested reservation amounts. The reservations would also give DFWP legal standing to object to changes in the place and type of use of existing water rights.

If senior water right holders constrain water availability in the future, then DFWP's requested reservations would pose less of a cost to new consumptive uses. If DFWP's reservations are granted at the lower inflection point, more water would be available for new consumptive uses, but there would still not be enough water available in the basin above Gold Creek for new full-service irrigation development.

Comparison of Net Benefits and Costs

The benefits and costs of DFWP's reservations are not easily compared. Unlike irrigation or dam construction projects, most of the benefits and costs associated with DFWP's requests do not have market values or cannot be reliably forecast and so are difficult to quantify. Also, the correlation between streamflows and resulting benefits has not been conclusively demonstrated on streams in the upper Clark Fork basin. The Board's decision to grant, modify, or deny DFWP's requested reservations will be based on a weighing and balancing of the qualitative benefits of maintaining flows for aquatic habitat, waste dilution, and recreation against the costs of foregone consumptive use development.

Tables 2-3 through 2-9 indicate the resources that would be most significantly affected by DFWP's requested reservations. The Board may use these tables and additional information presented by interested parties at the contested case hearing to assess each stream's fishery, riparian, recreational, and waste dilution value and to weigh these values against the potential for irrigation or other consumptive use development.

Alternatives

At present, a reservation is the only way DFWP can acquire a water right for instream flows. Most of DFWP's requests are based upon the upper inflection point. If DFWP's reservations are granted instead at the lower inflection point, more water would be available in most months for new consumptive uses, but there would still not be enough water available in the basin above Gold Creek for new full-service irrigation development. On reaches of the Clark Fork below Gold Creek, an additional 20.6 to 286.4 cfs would be available during August in 8 years out of 10. Granting DFWP less water than requested would also offer less protection to aquatic and riparian habitat, fisheries, water quality, and recreational opportunities. These resources could be degraded beyond existing conditions if new uses further deplete flows.

Irretrievable Losses

If DFWP's reservations are *not* granted, DFWP would be unable to prevent new water uses and subsequent depletions of streamflows in the basin. This may result in the irretrievable loss, especially in the tributaries, of fish species with limited numbers or distribution in Montana, including westslope cutthroat trout, bull trout, and shorthead sculpins. There also may be an irretrievable loss of spawning and rearing habitat and of habitat for resident and some migratory fish populations.

Public Health, Welfare, and Safety

Public health, welfare, and safety would not be adversely affected by DFWP's requested reservations. Maintenance of instream flows would help sustain existing levels of dilution flows, particularly in the Clark Fork main stem.

Table 2-3. Fish Species in the Upper Clark Fork Basin by Stream Reach.

Stream Reach	Gamefish: Cutthroat trout	Gamefish: Westslope cutthroat trout	Gamefish: Rainbow trout	Gamefish: Brown trout	Gamefish: Bull trout	Gamefish: Brook trout	Gamefish: Bull/Brook hybrid	Other fish: Mountain whitefish	Other fish: Largemouth bass	Other fish: Sculpin	Other fish: Shorthead sculpin	Other fish: Longnosed dace	Other fish: Largescale sucker	Other fish: Longnose sucker	Other fish: Redside shiner	Number of trout per mile (dominant game fish in parenthesis)	Comments
Clark Fork Reach 1 (Warm Springs-Garrison)	●		●	●	●	●		●		●			●	●	●	143-2334 (brown trout)	The first 2-3 miles of stream below the Warm Springs treatment ponds has developed a very good brown trout fishery since 1972 when no trout were present. Sculpins, a forage fish, are found in this reach. Trout numbers decrease as one moves downstream from the treatment ponds where metals are removed.
Clark Fork Reach 2 (Garrison-Drummond)	●		●	●	●		●	●	●			●	●			127-499 (brown trout)	Water quality is degraded from metals contamination.
Clark Fork Reach 3 (Drummond-Rock Creek)	●		●	●	●		●	●				●	●			48-123 (brown trout)	Sculpins, a forage fish, are absent from this reach. Northern squawfish, yellow perch, and pumpkinseed are found rarely.
Clark Fork Reach 4 (Rock Creek-Milltown Dam)	●		●	●	●		●	●	●			●	●			309-440 (brown trout)	Clean water from Rock Creek appears to dilute the dissolved metals. Northern squawfish, yellow perch, and pumpkinseed are found rarely.
Warm Springs Creek (upper)	●				●											502 > than 6" (brown trout)	Very good fish habitat. Fish reproduce naturally in this reach.
Warm Springs Creek (lower)				●			●						●			492 (brown trout)	This reach is important because brown trout and mountain whitefish from the Clark Fork use this reach to spawn. Water quality in the Clark Fork is not conducive to spawning.
Barker Creek		●	●		●	●							●			(bull trout)	Steep gradient stream probably used for spawning by bull trout from Warm Springs Creek. No population estimate available.
Cable Creek	●		●		●	●			●							1,197 (brook trout)	Only self sustaining population of rainbow trout in the Warm Springs Creek drainage. Brook trout most abundant, bull and cutthroat trout are rare. Provides clean water to Warm Springs Creek.
Storm Lake Creek	●				●	●										145	Provides clean water to Warm Springs Creek. Historically, flows have been diverted to Silver Lake by AMC.
Twin Lakes Creek		●			●	●	●									890 > than 6" (cutthroat and bull trout)	Fish from Warm Springs Creek may spawn here. Very good water quality.
Lost Creek	●			●	●	●		●					●	●		880 (brown trout)	Brown trout are the most numerous trout present. Sampling in the fall indicates a large number of brown trout and mountain whitefish from the Clark Fork may be using Lost Creek for spawning.
Racetrack Creek (upper)	●			●		●		●		●						?	Cutthroat trout are found throughout this reach while whitefish and brown trout are found in the lower end. Fish are generally small (less than 10") due to low nutrient levels. A popular fishing stream.
Racetrack Creek (lower)	●			●		●		●		●						585 (brown trout)	Brown trout from the Clark Fork may use this reach for spawning.

Sources: DFWP 1986b, MNRIS 1987, Thomas and Workman 1986 (See draft EIS.)

Table 2-3. (con'd) Fish Species in the Upper Clark Fork Basin by Stream Reach.

Stream Reach	Gamefish: Cutthroat trout	Gamefish: Westslope cutthroat trout	Gamefish: Rainbow trout	Gamefish: Brown trout	Gamefish: Bull trout	Gamefish: Brook trout	Gamefish: Bull/Brook hybrid	Gamefish: Mountain whitefish	Gamefish: Largemouth bass	Other fish: Sculpin	Other fish: Shorthead sculpin	Other fish: Longnosed dace	Other fish: Largescale sucker	Other fish: Longnose sucker	Other fish: Redside shiner	Number of trout per mile (dominant game fish in parenthesis)	Comments
Dempsey Creek	●			●		●										776-880	Cutthroat trout rare, brook trout common, and brown trout abundant
Little Blackfoot River (upper)		●	●	●	●	●	●	●		●						645	A productive fishery in a smaller stream
Little Blackfoot River (lower)	●		●	●	●	●		●		●	●			●		906 (brown trout)	The stream has been disturbed but the study reach has a substantial population of brown trout. Shorthead sculpins are a species of special concern because of their limited distribution.
Snowshoe Creek	●			●				●		●			●			475 (brown trout) > than 6"	Cutthroat trout are most numerous in the upper reaches of the stream while brown trout are more numerous in the lower stream reaches. The lower reaches are low gradient and appear to receive a considerable amount of groundwater inflow.
Dog Creek		●		●	●	●		●								541 (brown trout)	In an upstream section, 218 brown trout per mile were found while a lower reach had a population of 541 trout per mile, including all trout species. Genetically pure westslope cutthroat trout were found in this stream.
Gold Creek	●	?		●		●		●								370 in summer, 1,180 in fall (brown trout)	An important spawning stream. Brown trout and whitefish probably from the Clark Fork use this stream for spawning. Tributaries to the Clark Fork used for spawning are not common in this reach of the Clark Fork.
Flint Creek (upper)	●		●	●	●	●		●		●				●		877	A diverse fish population in a broad valley with extensive irrigation.
Flint Creek (lower)	●			●	●			●		●				●		567 (brown trout)	Fishery appears limited by siltation caused by bank erosion and turbid irrigation return flows.
Boulder Creek	●	?		●	●											317	Reaches above Princeton have a sparse trout population, while trout are more abundant near the mouth. Bull trout are reported to ascend the stream for spawning. The cutthroat appear to be pure westslope species.
North Fork of Flint Creek	●		●		●	●											One of two tributaries to Georgetown Lake used for spawning. Rainbow cutthroat hybrids, rainbow trout, and brook trout are known to spawn here.
Stuart Mill			●			●											This 1/3 mile long spring creek is used for spawning by Kokanee salmon, brook trout, and rainbow trout from Georgetown Lake in large numbers. Young fish move down into the lake.
Harvey Creek		●	●	●	●	●				●		●	●			127	Mostly small trout in this creek. Spawning runs from the Clark Fork seem to be cut off by an irrigation diversion near the mouth of the creek.
North Fork Lower Willow Creek		●				●										121/500 feet	A small creek with an abundant population of pure strain west slope cutthroat trout.

Sources: DFWP 1986b, MNFIS 1987, Thomas and Workman 1986 (See draft EIS.)

Table 2-4. Typical Animals and Waterfowl Use Found Along Clark Fork Tributaries Affected by the Reservation Process.

	Big Game							Furbearers							Waterfowl Use			Gamebirds			Winter Range	
Stream	Whitetail	Mule Deer	Moose	Elk	Black Bear	Bighorn	Mountain Goat	Beaver	Mink	Muskrat	Red Fox	Raccoon	Marten	Limited	Moderate	Substantial	Nesting	Mountain Grouse[1]	Gray Partridge	Pheasant	Deer	Elk	Comments
Warm Springs Creek (upper)	●	●	●	●				●	●	●							●					●	Critical elk range
Warm Springs Creek (lower)	●							●	●	●	●				●			●	●				Provides open water when other waters are ice covered
Barker Creek		●	●	●				●	●	●				●			●						
Cable Creek	●	●	●	●				●	●	●					●		●						
Storm Lake Creek								●	●	●							●						Waterfowl use not evaluated.
Twin Lakes Creek	●	●	●	●				●	●	●				●			●						
Lost Creek	●	●	●	●		●		●	●	●	●				●	●	●	●				●	Critical elk range
Racetrack Creek (upper)		●	●	●				●	●	●			●	●		●	●						Lynx are also present
Racetrack Creek (lower)	●	●	●	●				●	●	●					●		●	●					
Dempsey Creek	●	●	●	●				●	●	●				●			●	●				●	Critical elk range.
Little Blackfoot River (upper)	●	●	●	●	●			●	●	●					●		●						Waterfowl frequently observed on beaver ponds.
Little Blackfoot River (lower)	●	●			●			●	●	●					●	●	●						Franklin's grouse not present. High density of nesting red tailed hawks.
Snowshoe Creek	●	●		●				●	●	●					●	●	●	●					Groundwater inflow extends open water season.
Dog Creek		●	●	●				●	●	●					●	●	●						Waterfowl use in meadow and beaver pond sections
Gold Creek	●	●		●				●	●	●		●		●							●		Deer winter range found near the middle 2 miles.
Flint Creek (upper)	●	●	●	●				●	●	●				●			●	●					
Flint Creek (lower)	●	●	●	●				●	●	●					●	●	●	●					
Boulder Creek	●	●	●	●			●	●	●					●			●						
North Fork Flint Creek	●	●	●	●											●		●						Waterfowl use lower reach
Stuart Mill Creek	●		●						●	●					●	●	●						Provides open water during cold weather periods
Harvey Creek	●							●	●	●		●			●								Groundwater inflow extends open water season.
North Fork Lower Willow Creek Reservoir Site								●															Deer winter range 1.5 miles to southwest

[1]Mountain grouse category includes ruffed grouse, blue grouse, and Franklin's grouse

Sources DFWP, 1986b, Flath, 1987, Froenfelker, 1987; McCleerey, 1987; Nelson, 1987; Murphy, 1987 (See draft EIS.)

Table 2-5. Typical Plants and Condition of Vegetation Found Along Clark Fork Tributaries Affected by the Reservation Process.

Stream	Trees								Shrubs			Herbs	Vegetation condition		Comments
	Cottonwood	Aspen	Spruce	Subalpine fir	Lodgepole	Douglas-fir	Willow	Alder	Ninebark	Sedges	Grasses	Poor	Fair	Good	
Warm Springs Creek (upper)				●		●		●	●	●				●	Vegetation is well established.
Warm Springs Creek (lower)						●	●			●		●			Some riparian communities have been damaged by rapid flows and erosion due to nearby road construction.
Barker Creek		●	●			●	●							●	Trees and shrubs grow in dense stands.
Cable Creek												●			Extensive meadows near mouth. Lower sections are heavily grazed by livestock.
Storm Lake Creek		●	●			●	●								
Twin Lakes Creek		●	●			●	●								Flows through forested areas.
Lost Creek												●			Vegetation scarce in upper section. Condition improves to well preserved near the mouth.
Racetrack Creek (upper)														●	Abundant riparian vegetation.
Racetrack Creek (lower)												●			Vegetation scarce in upper section. Condition improves to well preserved near the mouth.
Dempsey Creek	●					●	●								Cottonwoods found on lower reaches
Little Blackfoot River (upper)			●	●		●	●								
Little Blackfoot River (lower)	●					●									
Snowshoe Creek											●				Riparian vegetation is severely restricted.
Dog Creek															Meadow sections present.
Gold Creek															No information available.
Flint Creek (upper)						●	●								Shrub thickets are scattered. Development of continuous shrub stands prevented by livestock grazing
Flint Creek (lower)						●	●								Shrub thickets are scattered and restricted by livestock grazing.
North Fork Flint Creek						●	●								
Stuart Mill Creek						●	●		●						
Harvey Creek															No information available.
Boulder Creek				●	●	●		●	●						Douglas-fir and ninebark grow on north aspects. Douglas-fir and lodgepole grow on south aspects. Willows and sedges near stream.
North Fork Lower Willow Creek Reservoir Site															Composed of prairie grassland, wet meadow, and stands of willow.

Sources: DFWP, 1986b; Murphy, 1987; Nielson, 1987 (See draft EIS.)

Table 2-6. Fishing Pressure (Angler Days per Year)

Stream or River	1985-86	1984-85	1983-84	1982-83	Average	N*
Clark Fork - R#1 Warm Springs Creek-Little Blackfoot	5,077	5,809	4,557	4,264	4,927	4
Clark Fork - from Little Blackfoot River - Bitterroot River	12,507	15,069	14,214	9,268	12,763	4
Warm Springs Creek R#1 Middle Fork-Meyers Dam	5,900	3,881	2,237	3,936	3,989	4
Warm Springs Creek R#2 Meyers Dam-Mouth						
Barker Creek					U	0
Cable Creek			412	150	281	2
Storm Lake Creek				50	50	1
Twin Lakes Creek		641		82	362	2
Lost Creek	1,057			411	734	2
Racetrack Creek R#1 North Fork to FS Boundary	698			191	445	2
R#2 FS Boundary to Mouth						
Dempsey Creek				193	193	1
Little Blackfoot River R#1 Blackfoot Meadows-Elliston	1,645	1,519	497	3,065	1,682	4
R#2 Elliston-Mouth	4,307	3,444	3,687	7,180	4,655	4
Snowshoe Creek		816		635	726	2
Dog Creek 206169101	1,336	2,568	274	391	1,142	4
Gold Creek	275	435		1,242	651	3
Flint Creek R#1 Georgetown Lake-Boulder Creek	4,103	5,373	4,634	3,417	4,382	4
R#2 Boulder Creek to Mouth						
Boulder Creek		523	733	1,559	938	3
North Fork Flint Creek		941		150	546	2
Stuart Mill Creek					U	0
Harvey Creek	412		420	150	327	3

*N= Number of years out of four with reported fishing pressure

Source: DFWP 1989.

Table 2-7. Water quality of streams where reservations are required.

Stream	Water quality classification[a]	Degree to which uses designated by a stream's water quality classification are impaired
Clark Fork		
Warm Springs Creek - Cottonwood Creek near Deer Lodge	C-2	The Clark Fork has been contaminated with sediment containing metals from past mining and related activities. Nutrients are present in the river from municipalities and agriculture at concentrations high enough to cause algae growth to be a nuisance. During the summer, dissolved oxygen levels have fallen below the state standard. Summer temperatures have risen to levels thought to be detrimental to trout. The river receives discharges from several municipal wastewater treatment plants. Flows have been altered. Overall, the degree to which uses have been impaired is severe.
Cottonwood Creek near Deer Lodge - Little Blackfoot River	C-1	
Little Blackfoot River - Blackfoot River	B-1	
Warm Springs Creek		
Above Meyers Dam Near Anaconda	A-1	Moderate impairment of use due to metals from past mining and related activities, habitat alteration, and sediment and flow alteration by migration.
Below Meyers Dam	B-1	
Barker Creek	A-1	None documented.
Cable Creek	A-1	Moderate impairment of use due to sediment from streambank erosion.
Storm Lake Creek	A-1	None documented.
Twin Lakes Creek	A-1	None documented.
Lost Creek	B-1	Moderate impairment of use due to sediment from agriculture and flow alteration.
Racetrack Creek	B-1	Moderate impairment of use due to sediment and flow alteration.
Dempsey Creek	B-1	Moderate impairment of use due to sediment and flow alteration.
Little Blackfoot River	B-1	Moderate impairment of use due to habitat alteration, flow alteration, sediment, and nutrients.
Snowshoe Creek	B-1	Moderate impairment of use due to sediment and flow alteration.
Dog Creek	B-1	Moderate impairment of use due to sediment.
Gold Creek	B-1	Moderate impairment of use due to habitat alteration from placer mining and sediment from agriculture. The stream is also a natural source of phosphorous, a nutrient that contributes to algae growth in the Clark Fork.
Flint Creek	B-1	Moderate impairment of use due to metals from past mining, sediment from mining and agriculture, and flow alteration.
Boulder Creek	B-1	None documented.
North Fork Flint Creek	A-1	None documented.
Stuart Mill Creek	A-1	None documented.
Harvey Creek	B-1	None documented.
North Fork Lower Willow	B-1	None documented.

Source: DHES. Undated.
Montana Nonpoint Source Assessment Report. Loren Bahls, Supervisor. Helena. 120 pp.
[a]See page 43 for a brief overview of the water quality classification system.

Table 2-8. Irrigable acreages in the upper Clark Fork basin

Drainage	Full service Acres not considering water availability	Full service Acres taking water availabilty into consideration
Clark Fork		
Bonner-Rock Creek	348	348
Rock Creek-Drummond	268	268
Drummond-Gold Creek	963	963
Gold Creek-Garrison	195	195
Perkins Creek	-0-	-0-
Warm Springs Creek	-0-	-0-
Carten Creek	-0-	-0-
Garrison-Deer Lodge	2,976	2,976
Mullan Gulch	-0-	-0-
Willow Creek	-0-	-0-
Deer Lodge-Warm Springs	1,248	1,248
Warm Springs Creek	-0-	-0-
Lost Creek	-0-	-0-
Racetrack Creek	-0-	-0-
Caribou Creek	-0-	-0-
Peterson Creek	-0-	-0-
Dempsey Creek	-0-	-0-
Cottonwood Creek	-0-	-0-
Fred Burr Creek	-0-	-0-
Tin Cup Joe Creek	-0-	-0-
LaMarche Creek	-0-	-0-
Barker Creek	-0-	-0-
Twin Lakes Creek	-0-	-0-
Flint Creek		
Drummond-Maxville	360	360
Lower Willow Creek	-0-	-0-
Maxville-Georgetown Lake	442	442
North Fork Flint Creek	-0-	-0-
Silver Creek	-0-	-0-
Boulder Creek	-0-	-0-
Little Blackfoot		
Garrison-Headwaters	1,042	1,042
Dog Creek	134	134
Snowshoe Creek	-0-	-0-
Trout Creek	-0-	-0-
Carpenter Creek	-0-	-0-
Six Mile Creek	-0-	-0-
Telegraph Creek	386	386
Total	8,362	8,362

Drainage	Full service Acres not considering water availability	Full service Acres taking water availability into consideration
Irrigable acreage along tributaries of Flint Creek		
Henderson Creek	446	-0-
South Fork Lower Willow Creek	182	-0-
West Fork Lower Willow Creek	142	-0-
Lower Willow Creek	179	-0-
Cow Creek	2,203	-0-
Marshall Creek	325	-0-
Total	3,477	-0-
Irrigable acreage along tributaries of the Little Blackfoot River		
Spotted Dog Creek	480	-0-
Trout Creek	576	-0-
Telegraph Creek	467	-0-
Snowshoe Creek	1,094	-0-
Carpenter Creek	518	-0-
Six Mile Creek	806	-0-
Gimlet Creek	557	-0-
Three Mile Creek	1,267	-0-
Total	5,765	-0-

Table 2-9. Estimated Flows in Excess of 50 Percent of the Average Annual Flow in Reaches 1 Through 4 of the Clark Fork, 8 Years out of 10.[a]

Reach	Location	50% Average[b] annual flow (cfs)	Excess Flows (cfs) Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	Deer Lodge	146	77.1	105.4	71.7	74.9	83.4	132	136.3	191.6	133.3	0	0	6.1
2	Below mouth of Little Blackfoot	289	0	14.7	0	0	0	53.1	147.9	468.7	312.7	0	0	0
2	Gold Creek	289	69.3	104.6	45.8	40.7	84.9	160.8	254.6	639.9	418.8	0	0	0
	Below mouth of Flint Creek	425	93.8	121.6	24	8.6	60	160.8	263.6	642.6	418.2	0	0	0
3	Above mouth of Rock Creek	425	178.4	186.3	113.4	31	114.1	211.8	376.6	595.4	656.4	0	0	30.8
4	Above mouth of Blackfoot River	525	319.8	319.6	208	159.6	263.2	368	657.6	1957.6	2159.8	407.4	61.4	176.6

[a]This table is a revised version of Table 5-2 in the draft EIS (page 51). Changes from the draft version have been made in response to comments received and additional gauge records for the years since the draft EIS was published. The flow estimates in this table are derived by subtratcing one-half of the average annual flow of record from simulated monthly flows based on DNRC's computer modeling.

[b]Under Montana law, the Board cannot grant an instream reservation on a gauged stream for more than 50 percent of the average annual flow of record.

Table 2-9.(con'd) Estimated Flows in Excess of DFWP's Requested Amounts on Reaches 1 through 4 of the Clark Fork, 8 Years out of 10.[a]

Reach	Location	DFWP's Request[b] (cfs)	Excess Flows (cfs) Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	Deer Lodge	180	43.1	71.4	37.7	40.9	49.4	98	102.3	157.6	99.3	0	0	0
2	Below mouth of Little Blackfoot	400	0	0	0	0	0	0	36.9	357.7	201.7	0	0	0
2	Gold Creek	400	0	0	0	0	0	49.8	143.6	528.9	307.8	0	0	0
3	Below mouth of Flint Creek	500	18.8	46.6	0	0	0	85.8	188.6	567.6	343.2	0	0	0
3	Above mouth of Rock Creek	500	103.4	111.3	38.4	0	39.1	136.8	301.6	520.4	581.4	0	0	0
4	Above mouth of Blackfoot River	600	244.8	244.6	133	84.6	188.2	293	582.6	1882.6	2084.8	332.4	0	101.6

[a]The flow estimates in this table are derived by subtracting the amount requested by DFWP from simulated monthly flows based on DNRC's computer modeling.
[b]The Board cannot grant an instream flow reservation for more than 50 percent of the average annual flow of record on gauged streams.

Estimated Flows in Excess of the Lower Inflection Points for Reaches 1-4 of the Clark Fork, 8 Years out of 10.[a]

Reach	Location	Lower inflection point (cfs)	Excess Water Available (cfs) Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	Deer Lodge	90	133.1	161.4	127.7	130.9	139.4	188.0	192.3	247.6	189.3	16.2	0	62.1
2	Below mouth of Little Blackfoot River	200	72.7	103.7	68.8	65.0	83.3	142.1	236.9	557.7	401.7	0	0	9.7
2	Gold Creek	200	158.3	193.6	134.8	129.7	173.9	249.8	343.6	728.9	507.8	24.1	0	46.3
3	Below mouth of Flint Creek	180	338.8	366.6	269.0	253.6	305.0	405.8	508.6	887.6	663.2	100.6	20.6	205.6
3	Above mouth of Rock Creek	180	423.4	431.3	358.4	276.0	359.1	456.8	621.6	840.4	901.4	211.3	100.3	275.8
4	Above mouth of Blackfoot River	300	544.8	544.6	233.0	184.6	788.2	393.0	682.6	2182.6	2384.8	632.4	286.4	401.6

[a]The flow estimates in this table are derived by subtracting the lower inflection point from simulated monthly flows based on DNRC's computer modeling.

Table 2-9. (con'd) Estimated Excess Flows on Reach 2 of the Little Blackfoot River, 8 Years out of 10.[a]

		Flows in Excess (cfs)											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
DFWP's Request	85	0	0	0	0	0	0	38[b]	299.8	198.8	0	0	0
50% Ave. Annual	82.5	0	0	0	0	0	0	40.5[b]	302.3	201.3	0	0	0
Lower Infl. Pt.	45	4.8	4.4	0	0	9.4[b]	21[b]	78[b]	339.8	238.8	25.8	0	0

[a]Based on the USGS gauge near the mouth of the Little Blackfoot River and simulated monthly flows modeled by DNRC.
[b]On tributaries, DFWP also requests all of the instantaneous base flow from January 1 through April 30. If this portion of the reservation is granted, there would be no excess water available during these months.

Estimated Excess Flows on Reach 1 of Flint Creek, 8 Years out of 10.[a]

		Flows In Excess (cfs)											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
DFWP's Request	50	23	4	0	0	0	0	19[b]	49	67	46	49	28
50% Ave. Annual	50 identical												
Lower Infl. Pt.	35	38	19	11	2[b]	8[b]	15[b]	34[b]	64	82	61	64	43

[a]Based on the USGS gauge at Maxville and simulated monthly flows modeled by DNRC.
[b]On tributaries, DFWP also requests all of the instantaneous base flow from January 1 through April 30. If this portion of the reservation is granted, there would be no excess water available during these months.

Estimated Excess Flows on Boulder Creek, 8 years out of 10.[a]

		Flows In Excess (cfs)											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
DFWP's Request	20	0	0	0	0	0	0	0	58	95	12	0	0
50% Ave. Annual	23.5	0	0	0	0	0	0	0	54.5	91.5	8.5	0	0
Lower Infl. Pt.	10	8	10	9	7[b]	7[b]	7[b]	10[b]	68	105	22	1	2

[a]Based on the USGS gauge on Boulder Creek at Maxville and simulated monthly flows modeled by DNRC.
[b]On tributaries, DFWP also requests all of the instantaneous base flow from January 1 through April 30. If this portion of the reservation is granted, there would be no excess water available during these months.

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